ANTARCTIC RESEARCH

Aeronomy & Astrophysics, Biology & Medicine, Environmental Research, Geology & Geophysics, Glaciology, Ocean & Climate Sciences

Program Announcement

NSF 01-81

OFFICE OF POLAR PROGRAMS

FULL PROPOSAL DEADLINE(S): June 1, 2001

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SUMMARY OF PROGRAM REQUIREMENTS

GENERAL INFORMATION

Program Title: ANTARCTIC RESEARCH

Synopsis of Program:

The National Science Foundation funds and manages the United States Antarctic Program and invites scientists at U.S. institutions to submit proposals -

- to perform research in Antarctica

- to perform related research and data analysis in the United States

For field work in the Antarctic, successful candidates will be provided laboratory support and operational support in addition to award of funding through home institutions.

This document -

- summarizes antarctic research opportunities
- describes support available in Antarctica
- explains how to prepare a proposal for research project support
- connects to an online system (the Electronic Support Planner) to be used in preparing an operational support package if your proposed project would involve field work in Antarctica
- links to further information

Cognizant Program Officer(s):

- See Office of Polar Programs roster on the NSF web site..

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.078 --- Office of Polar Programs

ELIGIBILITY INFORMATION

- **Organization Limit:** None
- **PI Eligibility Limit:** None
- **Limit on Number of Proposals:** None

AWARD INFORMATION

- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 110
- **Anticipated Funding Amount:** $10-million in FY 2002 pending availability (see section IV)

PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

- **Full Proposals:** Supplemental Preparation Guidelines
    - The program announcement/solicitation contains supplements to the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full program announcement/solicitation for further information.

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required.
- **Indirect Cost (F&A) Limitations:** Not Applicable.
- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full program announcement/solicitation for further information.

C. Deadline/Target Dates

- **Letters of Intent (*optional*):** None
- **Preliminary Proposals (*optional*):** None
- **Full Proposal Deadline Date(s):** June 1, 2001

D. FastLane Requirements

- **FastLane Submission:** Full Proposal Required
- **FastLane Contact(s):**
    - Desiree Marshall, Lead Program Assistant, Antarctic Sciences Section, 755, telephone: 703-292-8033, e-mail: Ant2001@nsf.gov.

PROPOSAL REVIEW INFORMATION

- **Merit Review Criteria:** National Science Board approved criteria. Additional merit review considerations apply. Please see the full program announcement/solicitation for further information.

AWARD ADMINISTRATION INFORMATION

- **Award Conditions:** Additional award conditions apply. Please see the program announcement/solicitation for further information.
- **Reporting Requirements:** Standard NSF reporting requirements apply.

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C. Antarctic Conservation Act (ACA)

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I. INTRODUCTION

The National Science Foundation invites scientists at U.S. institutions to submit proposals —

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- summarizes antarctic research opportunities
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Use this document with NSF's *Grant Proposal Guide*.

II. PROGRAM DESCRIPTION

RESEARCH AREAS

Scientific research, and operational support of that research, are the principal activities supported by the United States Government in Antarctica. The goals are to expand fundamental knowledge of the region, to foster research on global and regional problems of current scientific importance, and to utilize the region as a platform from which to support research. The U.S. Antarctic Program supports only that research that can be done exclusively in Antarctica or that can be done best from Antarctica. The research is performed by investigators from universities and, to a lesser extent, from Federal agencies and other organizations.

In the U.S. Antarctic Program, three year-round research stations, additional research facilities and camps, airplanes, helicopters, various types of surface vehicles, and ice-capable ships support approximately 130 research projects each year at numerous locations throughout the continent and the Southern Ocean. See the section below titled "Facilities, Logistics, and Support."

The program has been in continuous operation since the 1957-1958 International Geophysical Year. U.S. activities in Antarctica support the Nation's adherence to the Antarctic Treaty, which reserves the region for peaceful purposes and encourages international cooperation in scientific research. At present, 44 nations adhere to the treaty, and about 27 of them participate in antarctic

field activities. The United States cooperates scientifically and operationally with many of the Antarctic Treaty nations.

The National Science Foundation funds and manages the U.S. Antarctic Program. The Foundation's antarctic proposal to the Congress for FY 2001 is discussed in the OPP budget request and the NSF budget request.

The Foundation supports antarctic research in these areas:

Aeronomy and astrophysics

The polar regions have been called Earth's window to outer space. This term originally applied to study of aurora and other phenomena related to interaction of solar plasmas and fields. In this context the polar upper atmosphere is a screen on which the results of such interactions can be viewed and through which other evidence of space physics processes can pass. Today, this concept of Earth's polar atmosphere as a window includes research in other fields as well. With discovery of polar stratospheric ozone depletions, a window previously thought "closed" (the ultraviolet window) is now known to "open" in certain seasons. In astronomy and astrophysics, favorable atmospheric conditions and the unique location of the South Pole enable scientists to use this window to probe the structure of the Sun and the universe with unprecedented precision.

The aeronomy and astrophysics program supports studies of three regions:

- the stratosphere and the mesosphere. Current research focuses on stratospheric chemistry and aerosols, particularly in the context of the ozone hole. The polar stratosphere is expected to be a field of continued interest and growth.

- the thermosphere, the ionosphere, and the magnetosphere. These regions derive many of their characteristics from the interplay of ionized plasmas and energetic charged particles with geomagnetic and geoelectric fields. The upper atmosphere, particularly the ionospheric portion of it, is the ultimate sink of solar wind energy that is transported into the magnetosphere. Energy dissipates in the ionosphere because of particle precipitation, which is the result in part of resonant wave-particle interactions, and because of the Joule heating that is a result of currents driven by electric fields.

- astronomy and astrophysical studies of the regions of the universe outside the magnetosphere, including solar astronomy and cosmic ray physics. Astrophysical studies are primarily conducted at South Pole station or on long-duration balloon flights launched from McMurdo.

Major goals are to sponsor research that requires or would benefit from the unique conditions of the Antarctic, to contribute to understanding of the role of the Antarctic in global environmental change, to participate in interdisciplinary studies of geosphere-biosphere interactions in the middle and upper atmosphere, and to improve understanding of the coupling of the Earth's polar atmosphere with the magnetosphere and of the ways in which both are affected by solar activity.

Biology and medical research

The goal of antarctic biology and medical research is to improve understanding of life phenomena and processes. The program supports projects directed at all levels of organization from molecular, cellular, and organismal to communities, ecosystems, and global processes. Investigators should apply recent theory and technology to understanding how organisms, including humans, adapt and live in high latitude environments and how ecosystems may respond to global change. Support is focused on these areas:

- Marine ecosystem dynamics. Understanding the natural variability of marine ecosystems is the goal. An important direction is toward correlating the structure and function of the marginal ice-zone ecosystem with oceanic and atmospheric processes. Of particular interest is the influence of nutrient limitations on primary production and the role of marine phytoplankton in carbon dioxide cycling. Proposals to develop data collection technologies such as satellite remote sensing are encouraged.

- Terrestrial and limnetic ecosystems. Organisms in ice-free areas and in perennially ice-covered lakes show remarkable adaptations. The presence of relatively few species eases study of ecosystem dynamics and interpretation of experiments. Research is needed on adaptive mechanisms and evolutionary processes. Studies that include molecular biological approaches are encouraged. The McMurdo Dry Valleys of southern Victoria Land are of particular interest.

- Population biology and physiological ecology. Research is supported in population dynamics, especially metabolic, physiological, and behavioral adaptations of krill and other zooplankton and fish species. Marine mammals and birds have been the object of much research and merit further attention in some areas. Mechanisms necessary for maintenance of cell function in fishes and their feeding behavior are important topics. Long-term observations are needed to improve understanding of manmade or natural changes.

- Adaptation. The extremes of light, temperature, and moisture have resulted in unusual adaptations. Research topics include low temperature photosynthesis and respiration, enzymatic adaptations, adaptive strategies such as development of antifreeze compounds and modifications to circulation systems, and the response of organisms to increased UV-B from the ozone hole. Biotechnology offers unique approaches to addressing questions involving adaptation, and such applications are of special interest.

- Human behavior and medical research. Antarctica's extreme climate can induce social, psychological, and physiological stresses, particularly during the winter isolation, which can exceed 8 months. Research has applications to human health and performance both in the Antarctic and in other isolated environments such as space. Studies can focus on topics such as epidemiology, thermal regulation, immune system function, individual behavior, and group dynamics.

Geology and geophysics

Antarctica represents about 9 percent of Earth's continental crust and has been in a near-polar position for more than 100 million years. It is covered by a continental ice sheet with an average thickness of 3 km. There is unequivocal evidence that for a long period after the continent arrived at its high-latitude position, extensive continental ice sheets did not exist there. The ice sheets, through their interaction with and effect on oceanic and atmospheric circulation, play a key role in modulating global climate.

Some important program goals include:

- determining the tectonic evolution of Antarctica and its relationship to the evolution of the continents from Precambrian time to the present
- determining Antarctica's crustal structure
- determining the effect of the dispersal of antarctic continental fragments on the paleocirculation of the world oceans, on the evolution of life, and on global paleoclimates and present climate
- reconstructing a more detailed history of the ice sheets, identifying geological controls to ice sheet behavior, and defining geological responses to the ice sheets on regional and global scales
- determining the evolution of sedimentary basins within the continent and along continental margins

All of these problems involve the need for an improved understanding of where, when, and how Antarctica and its surrounding ocean basins were accommodated in the interplate movements inferred from studies of global plate kinematics. In short, the program encourages investigation of the relationships between the geological evolution of the antarctic plate and paleocirculation, paleoclimate, and the evolution of high-latitude biota.

In geophysics, the continent and its environs have a central role in the geodynamic processes that have shaped the present global environment. The tectonic role of the antarctic continent in the breakup of Gondwanaland, the close interaction of the antarctic crust and ice sheet with their attendant effects on the planet's fluid systems, and Antarctica's present-day seismically quiescent role defines the important thrusts of geophysical research in the high southern latitudes.

Ocean and climate systems

Antarctic oceanic and tropospheric studies focus on the structure and processes of the ocean-atmosphere environment and their relationships with the global ocean, the atmosphere, and the marine biosphere. As part of the global heat engine, the Antarctic has a major role in the world's transfer of energy. Its ocean/atmosphere system is known to be both an indicator and a component of climate change.

Research sponsored by the ocean and climate systems program is intended to improve understanding of the oceanic environment at high latitudes, including global exchange of heat,

salt, water, and trace elements, sea-ice dynamics, and tropospheric chemistry and dynamics. Major program elements include-

- Physical oceanography, concerned with understanding the dynamics and kinematics of the polar oceans, the effects of interface driving forces such as wind, solar radiation, and heat exchange, water mass production and modification processes, ocean dynamics at the pack ice edge, and the effect of polynyas on ventilation.

- Chemical oceanography, concerned with chemical composition of sea water and its global speciation, reactions among chemical elements and compounds in the ocean, fluxes of material within ocean basins and at their boundaries, and the use of chemical tracers to study time and space scales of oceanic processes.

- Sea ice dynamics, including study of the material characteristics of sea ice down to the individual crystal level and the large-scale patterns of freezing, deformation, and melting. These processes have implications for both atmospheric and oceanic "climates." Advances in instrumentation, including remote sensing or telemetering of ice type, thickness, motion, and growth, should enable large scale dynamics of sea ice to be monitored over long periods.

- Meteorology, concerned with atmospheric circulation systems and dynamics. Research areas include the energy budget; atmospheric chemistry; transport of atmospheric contaminants to the Antarctic; and the role of large and mesoscale systems in global exchange of heat, momentum, and trace constituents.

Glaciology

Snow and ice are pervasive elements of high latitude environmental systems and have an active role in the global environment. The glaciology program is concerned with the study of the history and dynamics of all naturally occurring forms of snow and ice, including floating ice, seasonal snow, glaciers, and continental and marine ice sheets. Program emphases include paleoenvironments from ice cores, ice dynamics, numerical modeling, glacial geology, and remote sensing of ice sheets. Some specific objectives are:

- Correlation of climatic fluctuations evident in antarctic ice cores with data from arctic and lower-latitude ice cores, and integration of the ice record with the terrestrial and marine record.

- Documentation of the geographic extent of climatic events noted in paleoclimatic records; and the extension of the ice core time series to provide information on astronomical forcing of climate.

- Establishment of more precise dating methodologies for deep ice cores.

- Determination of the Cenozoic history of antarctic ice sheets and their interaction with global climate and uplift of the Transantarctic Mountains; response of the antarctic ice sheets to the Pliocene warming.

- Investigation of the physics of fast glacier flow with emphasis on processes at glacier beds.
- Investigation of ice-shelf stability.
- Identification and quantification of the feedback between ice dynamics and climate change.

Environmental research

Environmental research is integrated into the disciplinary programs described above. An emphasis is research to help reduce the environmental impact of activities in Antarctica. Areas of inquiry might include effects of past practices, materials and waste management, current impacts, resilience of ecosystems, and promising technologies. The goal is to foster and maintain Antarctica's natural conditions while supporting the range of scientific research that can be done best in Antarctica.

Education

Placing research and learning hand in hand is NSF's highest priority. A strategy is to foster integration of research and education through the activities NSF supports at academic and research institutions.

Antarctica presents exceptional opportunities to integrate educational outreach into research projects. Scientists preparing research proposals have a rich variety of ways to respond to NSF's proposal evaluation criterion that asks how well the proposed activity will advance understanding while promoting teaching and learning; how well it will broaden the participation of underrepresented groups; to what extent it will enhance the research and education infrastructure (facilities, instruments, networks, partnerships, etc.); how well the results will be disseminated broadly to enhance scientific and technological understanding; and what may be the benefits to society of the proposed activity.

The NSF-supported *Teachers Experiencing Antarctica and the Arctic* -- itself an opportunity for investigators to put motivated K-12 teachers on their field teams -- has a web site with two topics that may help a proposal respond effectively to these newer NSF objectives: a list of Current Polar Research Community Outreach Projects and a tutorial, Educational Outreach and the Polar Research Community, intended to help polar scientists identify and leverage opportunities for integrating educational outreach into their research.

FACILITIES, LOGISTICS, AND SUPPORT

Facilities for research in Antarctica include year-round research stations with scientific equipment and laboratories, helicopters, ski-equipped airplanes, surface vehicles, a wide array of temporary camps, an ice-strengthened research ship, a research icebreaker, and a logistics icebreaker. These facilities are operated under the guidance of NSF's Polar Research Support Section (703-292-8032) by a prime antarctic support contractor, its subcontractors, and other contractors, by military units of the Department of Defense, and by the U.S. Coast Guard.

Construction associated with the South Pole Modernization Project will constrain some logistics-intense research, particularly that dependent on heavy-lift LC-130 airplane support, until around 2004.

McMurdo Station (77°53'S 166°40'E)

McMurdo, on Ross Island, is the hub of the U.S. Antarctic Program. Persons en route to South Pole and field camps pass through McMurdo. In the U.S. program, only Palmer Station is operationally separate. McMurdo is the largest station in Antarctica, accommodating up to 1,200 people in summer and 250 in winter.

McMurdo is the globe's farthest south land accessible by ship. It has a natural harbor, Winter Quarters Bay, accessed by a freighter and a tanker with Coast Guard icebreaker escort once a year in late summer.

U.S. antarctic air operations are centered at McMurdo. Nearby sea ice supports a runway for large transport planes between late September and early December, when flights are made between New Zealand and McMurdo several times per week. A second runway on groomed glacial ice can operate in most months; flights from New Zealand are made to it over several days in mid-August and again near the end of the summer season in February. A skiway on the adjacent Ross Ice Shelf can be used at any time of year by LC-130s _ ski-equipped, four-engine transports. LC-130s operated by the New York Air National Guard are stationed at McMurdo throughout the austral summer.

In winter the station historically has been isolated except for emergencies. However, scientific interest led to an NSF-sponsored workshop in 1999 that could result in increased winter access. The workshop report, Year-Round Access to the McMurdo Region: Opportunities for Science and Education, discusses the winter potential. It is intended to stimulate further consideration by the community, but does not have specific Foundation endorsement. Research might include extending summer measurements into the dark months; winter "access" may include virtual access through remote instrumentation as well as transportation improvements and likely would extend to the McMurdo Dry Valleys.

Communications between McMurdo and the rest of the world, available year-round, 24 hours a day, include telephone, electronic mail, and the Internet. Regular U.S. mail service is provided in the austral summer.

McMurdo is a major research center. Science facilities include the Albert P. Crary Science and Engineering Center (more familiarly, the Crary lab), opened in 1991. The laboratory is a large, state-of-the-art facility that enables sophisticated procedures in the disciplines appropriate to Antarctica. The lab's five wings total 4,320 square meters of working area for information, computing, and telecommunications including Internet; biology; earth sciences; atmospheric sciences; and an aquarium and wet lab. The lab has flexible-use laboratory space, environmental rooms, equipment rooms, microscope rooms, offices, facilities for handling hazardous chemicals including radioisotopes, and conference rooms. Most lab spaces have single-pass air and fume hoods. The facility has specialized benchtop equipment for use both in the building and remotely. It is stocked with scientific supplies, chemicals, and other consumables. It also supports environmental and ecological investigations, bioassays, industrial hygiene surveys,

chemical analyses, and snow and ice mechanics and engineering. A meteorology center has AVHRR, HRPT, DMSP, and other data archives and an interactive data access system.

Additional McMurdo facilities provide direct support to science involving diving, balloon launches, field party training and outfitting, upper atmosphere investigations, etc. In summer, portable shelters and equipment aid research on and under the sea ice of adjacent McMurdo Sound. Helicopters support projects and camps within 150 kilometers of the station; and surface vehicles provide local transportation and support for traverses.

The McMurdo region has been the object of vigorous scientific attention. An abundant literature presents questions for further study in marine biology, earth sciences, and other areas.
A McMurdo-Based Research Support Prospectus contains text and visual descriptions of capabilities for U.S. Antarctic Program researchers based out of McMurdo Station.

Amundsen-Scott South Pole Station (90°S)

Opened in 1957, Amundsen-Scott South Pole Station was rebuilt in 1975 as a research facility under a geodesic dome and steel arches. In recent years it has undergone substantial renovation and improvement to handle increased research needs. The station is undergoing a far-reaching modernization that by 2005 will substantially improve or replace existing structures and systems (see New South Pole Station Power Plant, Satellite Link Go Online).

South Pole Station is at an elevation of 2,835 meters on the continental ice sheet and has a mean temperature of minus 49.3°C.

Flights between McMurdo and South Pole are frequent from late October to mid-February; the station is isolated at other times. February-to-October (austral winter) population is about 50, but more than 200 can be accommodated in the summer; these numbers include construction personnel for the modernization program.

The station has an Atmospheric Research Observatory, the Martin A. Pomerantz Observatory for astrophysics, and computer systems for research and communication including Internet access. It has collected the longest continuous set of meteorological data from Antarctica's vast interior ice plateau, and it is well located for studies of the cusp region of the magnetosphere. Astronomy and astrophysics have flourished in recent years, taking advantage of excellent optical properties of the atmosphere (resulting from its high elevation, low temperature, and low humidity) and, for neutrino detection, the extremely clear and homogeneous thick ice below. A small biomedical research facility is present. Other areas of interest include geophysics, upper atmosphere sciences, and glaciology.

Palmer Station (64°46'S 64°03'W)

Palmer, on Anvers Island near the Antarctic Peninsula, has been in operation since 1965. It is operated in conjunction with the icebreaking research ship Laurence M. Gould. Small boats are available for sampling in the sea and at nearby islands. Access to Palmer, which is year-round, generally is by ship from the southern tip of South America.

The climate at Palmer is less severe than that at the other U.S. stations, and the fauna and flora are diverse. There are many opportunities for biology at or near the station; other disciplines

(e.g., meteorology, upper atmosphere physics) also are represented. Palmer has extensive biology laboratories, including wet lab areas and sea water aquaria. Palmer's population has ranged from 8 to 12 in winter to 43 in summer.

The Palmer Station area since 1990 has been a National Science Foundation Long Term Ecological Research (LTER) site. For information contact the biology program manager at OPP.

Temporary camps

In the austral summer, aircraft from McMurdo can place scientific parties almost anywhere on the continent. Tents or heated shelters and snowmobiles can be provided. Helicopters sometimes are deployed to remote locations for close support of research parties. Substantial camps remote from McMurdo Station can be established for large research groups. Camps can be placed by ship in the Antarctic Peninsula area.

Automated data gatherers (AGO and AWS)

The program supports automated geophysical observatories (AGOs) for unmanned collection of data at remote locations. Investigators wishing to use these facilities or the resulting data should look at the web site or contact an Office of Polar Programs science program manager (roster).

Under NSF sponsorship, the University of Wisconsin has placed automatic weather stations (AWSs) at locations in Antarctica for research and operations. Information and data are freely available.

UV radiation monitoring network

The U.S. Antarctic Program supports the operation of precision spectroradiometers optimized for measuring solar ultraviolet radiation at South Pole, Palmer, and McMurdo in Antarctica and at Ushuaia, Argentina; Point Barrow, Alaska; and San Diego. Data are distributed regularly in support of seasonal research and are available annually on CD-ROM. The data include irradiance scans and databases of integrated UV exposure and a variety of dosages. Contact Biospherical Instruments.

Research ships

For capabilities and schedules of research icebreakers, visit the Marine Operations home page.

Laurence M. Gould. This icebreaking research and resupply ship accommodates 28 researchers and support technicians, most in double rooms with bathrooms. Another eight people can be accommodated in berthing vans for crossing the Drake Passage. It is equipped for marine biology, physical and chemical oceanography, and marine geophysics. It operates typically along the Antarctic Peninsula and in the South Shetland Islands; research cruises can be made elsewhere as required. Several trips are made between South American ports and Antarctica each austral summer; the ship regularly transports people and supplies between southern South America and Palmer Station. It entered into U.S. Antarctic Program service in 1997 under a 10-year charter from the builder and operator, Edison Chouest Offshore**.**

The hull has an ice classification of ABS-A1 rated for light icebreaking. The ship is thus permitted to perform missions in moderate pack ice, but must stay clear of heavy ice and consolidated pack to avoid besetment.

Research equipment includes a seismic system, a portable isotope laboratory, and dedicated oceanographic instrumentation (e.g., CTD). The ship has a deep sea trawl winch and hydrographic winches, cranes, an interior staging area with telescoping side boom, and starboard and aft A-frames. It has satellite navigation, radar, and precision depth recorders.

The ship's name commemorates Laurence M. Gould (1896-1995), chief scientist and second in command on Richard E. Byrd's first antarctic expedition, president of Carlton College, leader of the U.S. delegation to planning meetings for the antarctic portion of the International Geophysical Year, member of the National Science Board, and chairman of the National Academy of Sciences Polar Research Board, among other things.

Nathaniel B. Palmer. A research vessel with icebreaking capability, *Nathaniel B. Palmer* began antarctic operations in 1992 under a 10-year lease with the builder and operator, Edison Chouest Offshore. The ship is a first-rate platform for global change studies, including biological, oceanographic, geological, and geophysical components. It can operate safely year-round in antarctic waters that often are stormy or covered with sea ice. It accommodates 37 scientists and support technicians, has a crew of 22, and is capable of up to 75-day missions. It has 4,100 sq ft (380 sq m) of working deck area, 4,000 sq ft (370 sq m) of laboratory spaces, and modern oceanographic equipment.

Research equipment includes a seismic system, a portable isotope laboratory, and dedicated oceanographic instrumentation (e.g., CTD). The ship has a deep sea trawl winch and hydrographic winches, cranes, an interior staging area with telescoping side boom, and starboard and aft A-frames. It has satellite navigation, radar, precision depth recorders, multichannel and single channel seismic system, Seabeam bottom profiler, and acoustic doppler current profiler.

The ship is named *Nathaniel B. Palmer* to commemorate the American sealer credited with first seeing Antarctica, in 1820. Nathaniel Palmer later led a prosperous career as a sea captain and a designer and builder of clipper ships.

Underway measurements. Instruments on *Nathaniel B. Palmer* and *Laurence M. Gould* are available for not-to-interfere underway measurements on behalf of investigators who do not join a cruise. Instruments include Seacat 21 thermosalinograph, Turner model 10 fluorometer, Simrad EK500 scientific echo sounder and other acoustic and bathymetric systems, LaCoste-Romberg gravity meter, XBTs, and meteorological sensors. A Seabeam wide-swath bottom mapping system is installed on the *Nathaniel B. Palmer*. Proposals for management of long-term measurements and data archiving will be considered. Identify technician staffing and other shipboard support both in the proposal and on the *Nathaniel B. Palmer* worksheet.

*Other ships***.** University-National Oceanographic Laboratory Systems ships operate in the Southern Ocean in some years; see also the NSF Division of Ocean Sciences Web page . The Coast Guard icebreaker that provides operational support near McMurdo can provide underway research support in the Southern Ocean and the Ross Sea; direct a proposal for such support to the NSF Office of Polar Programs. Research ships of other Antarctic Treaty nations operate in antarctic waters (see "Non-U.S. facilities; international cooperation").

Airborne sensing

The Support Office for Aerogeophysical Research (SOAR) is a research facility at the University of Texas at Austin that supports OPP-sponsored aerogeophysical work in Antarctica. The facility has operated a suite of geophysical systems (gravimeter, magnetometer, laser altimeter, and ice-penetrating radar) aboard a Twin Otter airplane. Positional information is provided by differential GPS (both pseudo-range and carrier-phase), supplemented by inertial navigation and precision pressure altimeter data.

SOAR was supported through a cooperative agreement between NSF and the University of Texas at Austin. However, the current award to SOAR does not support new data acquisition beyond the 2000-2001 austral summer. Consequently, investigators interested in this capability must contact SOAR and their cognizant NSF program officer.

High precision GPS

The Global Positioning System (GPS) is a worldwide, all-weather navigation and positioning system operated by the Department of Defense. GPS has been used in Antarctica for several years. The use of GPS for high precision antarctic surveying (1 mm-10 m) is increasing, with applications including geodetic surveying, glacial flow measurement, aircraft position, velocity and acceleration determination, mapping, seismic instrument positioning on moving ice sheets, glacial geology, isostasy, and sample positioning.

The U.S. Antarctic Program has an agreement with University Navstar Consortium (UNAVCO) for GPS support including equipment and predeployment support. Support includes (1) a pool of geodetic quality receivers for the field season, (2) in-field equipment repair, (3) in-field engineering support, (4) in-field and predeployment training in the use of GPS receivers, (5) training in GPS data processing, (6) archiving of GPS data, and (7) assistance in project planning and experiment design.

UNAVCO's assistance in the design of projects includes advice about both field support and data processing. Resources are limited, and investigators who have their own receivers and field staff are encouraged to use them. Investigators who do not have access to geodetic-quality GPS receivers and are contemplating their use for high-precision surveying as part of their proposed work should contact UNAVCO to discuss the requirements. In general, proposals should build GPS expertise into the science project plan and the budget.

On the Operational Requirements worksheets (see section with this title), specify the number of receivers required, the time needed to complete the GPS field work, and the in-field engineering required from UNAVCO. Describe how the work will be done, including any need for permanent markers. Contact UNAVCO if you need help developing this information.

Synthetic aperture radar

NSF encourages proposals to use synthetic aperture radar (SAR) data in oceanography, sea-ice research, glaciology, and geology. Under an agreement between NASA and NSF, an earth station has been put into operation at McMurdo. Similar earth stations have been established at the Japanese antarctic station Syowa and the Chilean antarctic station O'Higgins, enabling SAR data to be acquired from a large part of Antarctica. Data are available for areas north of 79° from

the European Remote Sensing Satellites ERS-1 and ERS-2 and the Canadian satellite RADARSAT. Opportunities exist for interferometric studies utilizing ERS-1 and -2 data collected with a 1-day separation between images. The first antarctic imaging campaign was completed on 20 October 1997, and a map was completed in 2001.

Access to data is regulated according to international agreements between NASA and the foreign flight agency responsible for the satellite. For ERS-1 and ERS-2, data received through McMurdo are available through the Alaska SAR Facility (ASF) at the University of Alaska, Fairbanks, which is sponsored by NASA. All other antarctic SAR data from ERS-1 and ERS-2 must be requested through the European Space Agency. Antarctic RADARSAT data are available through the ASF to approved investigators.

Agreements between NASA and the space agencies require you to be a registered user to obtain ASF's SAR-related data. Investigators submitting proposals to the U.S. Antarctic Research Program for analysis of SAR data must also submit a proposal to NASA to receive data credits.

For more information about SAR data, contact the Alaska SAR Facility. NASA's Earth Science Enterprise offers related opportunities. For U.S. Antarctic Program information, contact the OPP program officer for your area of research.

Polar ice coring

The University of Wisconsin provides ice coring and drilling under NSF contract to meet technological requirements of glaciologists and others. Services include design, fabrication, and operation of ice drilling equipment in Antarctica, Greenland, and high alpine areas. Direct support to science parties as tasked by the Office of Polar Programs can include coordination of science support requirements, collection and dissemination of data, facilities and equipment, information systems, and logistics. Ice drilling and technical services include electro-mechanical ice core drills, hot water drill for deep access holes and shot holes, and sub-ice sampling. Notify the relevant NSF program manager (see roster) when you are requesting ice coring support.

Specimens for research

Specimens collected in the Antarctic are available to qualified investigators for study. For information, including the policies and procedures for obtaining samples, contact the facilities listed below.

Ice cores. The U.S. National Ice Core Laboratory, supported by USGS and NSF, houses approximately 12,000 meters of ice cores recovered from Greenland and Antarctica that are available for study.

Ocean-bottom sedimentary cores and grab samples; continental cores. Shipboard coring supported by the U.S. Antarctic Program over four decades has produced the world's largest collection of antarctic piston cores, housed at the Antarctic Research Facility, Florida State University. Investigators planning proposals that would result in collection of new marine sediment cores should contact the curation facility during proposal development. The facility can provide information about core handling protocols and, in special cases, can provide assistance to projects if planned and justified in the proposal. It should be considered the final repository for core material remaining from a project unless other specific arrangements are made.

Meteorite samples. More than half the world's meteorites available to science have been recovered from Antarctica since 1969. Samples are managed, described, curated, and made available for research at Johnson Space Center, NASA, under an interagency agreement between NSF, NASA, and the Smithsonian Institution.

Biological specimens. Some 20,000 samples comprising hundreds of thousands of specimens of antarctic benthic invertebrates, plankton, algae, and fish collected by U.S. Antarctic Program researchers are available for study and identification. The Smithsonian Institution Department of Invertebrate Zoology handles the collection under a cooperative agreement with NSF. NSF-sponsored polar investigators continue to deposit specimens and data.

Maps, aerial photographs, and related information

An Antarctic Resource Center at the U.S. Geological Survey maintains the Nation's most comprehensive collection of antarctic maps, charts, satellite images and photographs. Formerly the United States SCAR (Scientific Committee on Antarctic Research) Library, the center is managed through an interagency agreement with the National Science Foundation that also supports USGS mapping and geodesy in the Antarctic.

Non-U.S. facilities; international cooperation

The United States cooperates in research with other Antarctic Treaty nations. U.S. scientists wishing to do research with other nations' programs are asked to contact an Office of Polar Programs program manager before submitting a formal proposal.

The U.S. Antarctic Program is enthusiastically open to cooperation with other Antarctic Treaty nations when mutually beneficial. These projects often occur because of initiative taken by individual scientists. In your discussions, remember that individuals cannot commit U.S. Antarctic Program resources. Your acceptance of a generous offer from another nation's antarctic program could be construed as commitment of U.S. resources for some later project.

Do not hesitate in your collaboration with overseas colleagues, but please contact an OPP program manager (703-292-8033) upon commencing discussions that could lead to U.S. Antarctic Program involvement.

ANTARCTIC CONSERVATION ACT (ACA) OF 1978

Public Law 95-541, the Antarctic Conservation Act of 1978, requires your involvement from the time you write a proposal to the time you leave Antarctica.

The law protects native mammals, birds, and plants and their ecosystems. The law applies to all U.S. citizens, whether or not they go to Antarctica with the U.S. Antarctic Program. It applies to all expeditions to Antarctica that originate from the United States.

The Act makes it unlawful, unless authorized by permit —

- to take native mammals or birds
- to engage in harmful interference

- to enter designated special areas
- to introduce species
- to introduce substances designated as pollutants
- to discharge designated pollutants
- to import certain antarctic items into the USA

The Act provides penalties of up to $25,000 and 1-year imprisonment for each violation. Other penalties could include removal from Antarctica, rescission of a grant, or sanctions by your employer.

A Protocol on Environmental Protection signed in 1991 by representatives of the United States and other Antarctic Treaty nations entered into force in 1998. The protocol strengthens antarctic environmental standards, and recent U.S. regulations under the Antarctic Conservation Act bind U.S. citizens to the Protocol.

The book *Antarctic Conservation Act of 1978 (Public Law 95-541), with Regulations, Descriptions and Maps of Special Areas, Permit Application Form, Agreed Measures for the Conservation of Antarctic Fauna and Flora, and Protocol on Environmental Protection* (NSF 95-154) is free from NSF.

The following paragraphs discuss major provisions of the Antarctic Conservation Act and the Protocol on Environmental Protection.

Taking native mammals or birds

It is unlawful, unless authorized by permit, to take antarctic native mammals or birds. To *take* means to remove, harass, molest, harm, pursue, hunt, shoot, wound, kill, trap, capture, restrain, or tag a native mammal or bird or to try to do so.

If you are on the sea ice near McMurdo and try to hustle a Weddell seal into position for a photograph, you are breaking the law. If you are an ornithologist with a grant to band giant petrels, you may not do so until you apply for and receive a permit. A grant and a permit are two different things.

Mineral samples for scientific purposes normally may be collected and removed from Antarctica without an Antarctic Conservation Act permit. However, the Act requires a permit for "any activity that results in the significant adverse modification of habitats of any species or population of native mammal, bird, plant, or invertebrate." The Antarctic Protection Act of 1990 (Public Law 101-594) states, "it is unlawful for any person to engage in, finance, or otherwise knowingly provide assistance to any antarctic mineral resource activity."

Entering designated special areas

A number of precisely defined places in Antarctica are designated under the Antarctic Treaty, and in the U.S. law, as Specially Protected Areas or Sites of Special Scientific Interest. You must have a compelling need to enter one of these areas, and you must have a permit to do so.

Some of these special areas are near stations, such as Arrival Heights next to McMurdo or Litchfield Island near Palmer. Other special areas like the Barwick Valley are in remote locations in which geologists, for example, may want to work. The areas and their *management plans*, with which you must comply if you are permitted to enter, are described in publication NSF 95-154.

Introducing species

Introducing nonindigenous species to Antarctica (*i.e.*, south of 60°S latitude) generally is prohibited. However, if your work requires it, a permit may be issued for the following species under controlled conditions:

a. domestic animals and plants

b. laboratory animals and plants including viruses, bacteria, yeast, and fungi

Living nonindigenous species of birds may not be introduced into Antarctica.

If you are uncertain whether the species you need to take to Antarctica is considered an introduced species, please contact the antarctic biology program at NSF (see roster in the NSF Web site).

Introducing substances designated as pollutants

The Antarctic Conservation Act regulates what types of materials can be taken to Antarctica and specifies how these materials must be used, stored, and disposed of.

Banned substances. These substances are banned from Antarctica:

a. pesticides (except those required for science or hygiene: a permit is needed)

b. polychlorinated biphenyls (PCBs)

c. nonsterile soil

d. polystyrene beads and plastic chips

Designated pollutants. This category is large and will require attention if you get a grant to work in Antarctica. Then, the Foundation's prime antarctic contractor will help you report the materials that fall in this category.

At the proposal stage, it is enough to think about how to *minimize* the types and amounts of substances you need, to *substitute* benign substances for designated pollutants wherever possible, and to *handle* the designated pollutants that you must take. In the proposal and, if you get a grant, in your later dealings with the prime antarctic support contractor, err on the side of *disclosure*. In the proposal's *Operational Requirements* package (see section with this title below), use the worksheet to list major amounts of waste you expect to generate.

Designated pollutants include any substance listed by name or characteristic (flammable, corrosive, reactive, toxic) in the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act, and other U.S. regulations. Waste containing designated pollutants is *antarctic hazardous waste*, and it has to be used, stored, and disposed of in controlled ways.

Many research and industrial supplies — and common substances like lighter fluid and fingernail polish remover — at U.S. antarctic stations are designated pollutants. Designated pollutants must be *permitted* to enter Antarctica. NSF's prime antarctic support contractor annually compiles an application for a master permit to cover common items. The task obviously requires the cooperation of grantees; this chore is part of preparing for research in Antarctica.

Discharging designated pollutants

Some categories of waste must be removed from Antarctica. The list includes radioactive materials, batteries, fuel, heavy metals, lubricants, treated timbers, plastic (except low density storage bags), solid noncombustibles, and drums that held oil or chemicals.

The U.S. Antarctic Program employs specialists to handle and remove designated pollutants in accordance with the regulations. Grantees receive assistance and instructions in the Antarctic, but are required to keep track of the designated pollutants they use, to sort and store them according to instructions provided, and to turn the waste over to U.S. Antarctic Program officials in accordance with specified procedures.

Open burning is prohibited in Antarctica. If your proposal will include the operation of a remote field camp, plan to haul all your trash back to the station or ship from which you began your sortie.

Import into and export from the USA

In the United States it is unlawful, unless authorized by regulation or permit, to have or sell, or to import or export, antarctic plants from Specially Protected Areas, antarctic mammals, or antarctic birds. An application for a permit must demonstrate that the import or export would further the purposes for which the species was taken or collected, demonstrate that the import or export is consistent with the purposes of the Antarctic Conservation Act, and state which U.S. port will be used. There are seven designated ports: New York, Miami, Chicago, San Francisco, New Orleans, Seattle, and Honolulu.

Mailing items to or from the United States constitutes import or export.

Applying for a permit

You are the person who initially decides if an Antarctic Conservation Act permit will be needed for your proposed activities. If there is any doubt, contact an Office of Polar Programs science program manager, the permit officer, or the environmental officer (see roster).

If a permit appears necessary, send the *Antarctic Conservation Act Application and Permit Form* to the National Science Foundation at the address shown on the permit. Do *not* send it to the prime support contractor. You may send the permit application to NSF with the *Operational Requirements* package described below, or you may send it separately. Be sure NSF gets it no later than 90 days before field work is to start. During the 90 days, a summary of your application is published in the *Federal Register* so that any member of the public can comment on it. The Foundation evaluates the public comments and performs an internal review. It then approves the application, approves it with modifications, or disapproves it. NSF will not allow work in Antarctica until a permit either has been approved and issued or is found to be not

required. You may not conduct research or other activities that require a permit unless you have a permit. An application cannot be made retroactive.

III. ELIGIBILITY INFORMATION

The categories of proposers identified in the Grant Proposal Guide are eligible to submit proposals under this program announcement/solicitation.

Federal agencies may submit proposals subject to NSF and Office of Polar Programs policy. Please consult the relevant program manager for further information.

IV. AWARD INFORMATION

In the U.S. Antarctic Program, NSF expects each year to fund approximately 110 standard and continuing research awards (see definitions in chapter V.A. of the Grant Proposal Guide) up to 3 years in duration depending on the quality of submissions and the availability of funds. In exceptional cases, awards for up to 5 years may be considered if the justification and promise are compelling. Approximately $10 million may be available for new awards to scientists at research institutions in FY 2002. If the award is a continuing award, additional amounts will be forthcoming in future fiscal years. In addition, and separate from the award to your institution, field and laboratory support will be available in Antarctica. Anticipated date of awards: no earlier than October 2001.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal:

Proposals submitted in response to this program announcement/solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF *Grant Proposal Guide* (GPG). The complete text of the GPG is available electronically on the NSF Web Site at: http://www.nsf.gov/cgi-bin/getpub?nsf012. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 or by e-mail from pubs@nsf.gov.

In addition, every investigator submitting an antarctic proposal must:

1. Whether or not field work is being requested, submit a Field Requirements Statement For Antarctic Proposals (http://www.nsf.gov/od/opp/antarct/fldreqmt.htm). Every antarctic proposal must contain this worksheet. Place the worksheet in the Supplementary Docs section of your FastLane proposal.
2. If field work is to be performed, pay attention to Section V.B., below, as you prepare the budget that you submit via FastLane.
3. If field work is to be performed, read the instructions that follow in the rest of Section V.A. By 1 June, complete Operational Requirements Worksheets (ORW) using the Electronic Support Planner (http://esp.polar.org/).

A proposal will not be complete until you have used these steps to inform the National Science Foundation of your intentions regarding antarctic field work.

Operational requirements package

A researcher proposing field work in the Antarctic prepares a separate operational requirements document, not submitted on FastLane, using the U.S. Antarctic Program Electronic Support Planner (ESP).

The ESP contains mandatory worksheets, other worksheets, and a way to attach tables, sketches, or anything clear and organized that will help NSF evaluate your operational needs. *Details* of operational matters are not required, but NSF needs to know the *scope* of your plan so research-support specialists can evaluate how to support it.

The worksheets were devised by antarctic research-support specialists who have years of experience in helping investigators plan field work. Some of the worksheets are not required. Use the ones that are relevant to your needs and that, in your judgment, help to present your operational needs. If a worksheet is not germane to your work, don't complete it and don't submit it.

The U.S. Antarctic Program is committed to the principle that scientific needs should determine the research conducted in Antarctica, with logistics deriving from and supporting the research rather than dictating it. Prepare your proposal to NSF with the presumption that science can be supported operationally, even if it has not been done before.

To the extent that it is technologically and financially possible, this principle is reflected in the field program. However, at any given time some proposals, highly meritorious scientifically, are not feasible operationally. The antarctic support system and sometimes the proposed field research itself must be modified.

Prior discussion with a science program manager in the Office of Polar Programs (703-292-8033) can help define research objectives that match the operational realities at any given time and will help NSF plan changes in operational support to meet research needs. For investigators who have not previously worked in Antarctica, contact with the Polar Research Support section of the Office of Polar Programs (703-292-8032) during proposal preparation also can be helpful.

Operational capabilities of the U.S. Antarctic Program have evolved greatly in response to scientific requirements and will continue to do so, motivated primarily by dialog between the U.S. Antarctic Program staff and the research community.

If the proposal appears likely to be approved, NSF's prime antarctic support contractor will solicit details formally by means of a Support Information Package - a SIP - that is based on the information and worksheets you submit via the ESP.

The Antarctic Conservation Act *Application and Permit Form* is on the NSF home page and is not a part of the Electronic Support Planner.

Other considerations for the operational requirements package

Candidates, particularly those who have not participated in the U.S. Antarctic Program, are invited to contact science program managers or operations specialists at the Foundation's Office of Polar Programs (see roster). The reason for these contacts is to help assure an effective research proposal that is supportable operationally and to help NSF match the program's operational support capabilities with projected science requirements. While the formal proposal is intended to achieve that end, Office of Polar Programs staff have observed that informal discussion with scientists in advance of a proposal can help to develop field support that is responsive to science while satisfying safety, environmental, and health requirements.

Environmental protection and waste management

Your operational requirements package must convince the Foundation that your project, if approved, can be performed in compliance with antarctic environmental regulations. The worksheets will help you think through and define your plans. Much of your conservation planning will involve common sense - minimizing pollution, avoiding interference with animals - but the regulations are complex, and you cannot rely on common sense unassisted. Failure to provide for conservation and waste management in your proposal could change the Foundation's decision from award to declination.

The section in this document on the Antarctic Conservation Act contains summary information that should be enough for most projects. However, do not hesitate to review the Antarctic Conservation Act book (NSF 95-154) to be sure you understand your responsibilities for environmental protection and waste management. Fill out the Environmental Assessment Questionnaire and, if necessary, an Antarctic Conservation Act permit application (see below).

By attending to these matters in your planning you will enable NSF staff to start to plan support of these aspects in time to avoid delaying or interrupting your field work. Neither the planning nor the implementation need be overwhelming. NSF and investigators have learned that diligence at the proposal stage prevents headaches later.

Safety and health

A project that involves work in Antarctica must consider aspects of the research that may pose safety and health risks. Current U.S. Antarctic Program policies regarding safety and health are consistent with U.S. laws and regulations affecting research in the USA.

Office of Polar Programs safety and health specialists will review your proposal and operational requirements carefully. They have found that most proposed antarctic research can be carried out without undue risk. However, advance planning is essential, often in collaboration with the proposer. Your full and careful attention to safety and health aspects will help to make the planning efficient and effective. During review you may be asked for more information.

Grants are made only if questions regarding a project's safety and health risks can be resolved.

Two Office of Polar Programs staff are assigned full time responsibilities in safety and health. Please feel free to call or write them (see roster) during proposal preparation.

Radioactive materials and waste

If you wish to use radioactive materials (open or sealed sources) in Antarctica, you need to do so under your institution's radiation use license and with the approval of the U.S. Antarctic Program. Buy the materials through your institution, and register as a radioisotope user with its radiation safety committee. You also must abide by requirements imposed by the U.S. Antarctic Program, in particular radioactive waste generation and packaging criteria for proper disposal of low-level radioactive waste generated during the research.

If your research involves use of radioactive materials in Antarctica (open or sealed sources), complete the Radioactive Materials worksheets in the Operational Requirements package.

Investigators who have completed that worksheet will receive an additional questionnaire, after the proposal has been funded, requesting details of their proposed radioisotope usage. Proposed use of radioisotopes needs to be consistent with your institutional license and U.S. Antarctic Program policies. An institutional Radiation Safety Officer will be required to endorse your use of radioisotopes in Antarctica. Submit the worksheet in the *Operational Requirements* package.

Research ship EEZ clearances

Any research that is north of 60°S and involves work in the Exclusive Economic Zone (EEZ) of another nation (typically within 200 nautical miles of the coast of that nation), including underway measurements such as collecting multibeam data, gravity data, or surface water samples, requires an appropriate research clearance from the nation involved.

Justify any EEZ work in the operational reqirements package, and provide information needed for a permit application. NSF's prime antarctic contractor submits the application to the Department of State, which must receive it no later than 6 months before the cruise.

Composition of field teams

Identify in your operational requirements package all people who will be involved in the prospective field project. Team members should be scientists, technicians, or students with experience or strong interests in the discipline of the project and should have a direct interest in its outcome.

Parties that intend to work in remote areas must have field safety expertise that is appropriate for the anticipated activities, conditions, and hazards. Examples of potentially hazardous situations include mountaineering activities, working in crevassed terrain, and working on sea ice. Investigators should consider augmenting their teams with persons experienced in field safety, particularly if the group is inexperienced in antarctic field work. Training of field party members in first aid is highly recommended.

Physical and psychological screening

Because medical facilities in Antarctica are not equipped to deal with all possible medical emergencies, and because immediate medical evacuation may be impossible, it is important that all persons deploying to Antarctica be in good health. Before deploying, participants must meet physical and dental health criteria established for the program. Candidates for work during the austral winter isolation also must pass a psychological screening.

Prospective travelers to the Antarctic with the U.S. Antarctic Program will be provided medical and dental examination forms by the antarctic support contractor. Travelers are responsible for completing their physical and dental examinations and sending the completed forms to the support contractor. Candidates for the winter isolation period will be provided instructions for the psychological screening.

PROPOSAL DOs AND DON'Ts

A proposal must convince skeptics (reviewers, panelists, NSF) that the public good will be served by giving you public money. Suggestions:

Do read and follow this document and the *Grant Proposal Guide*.

Do keep text short.

Do state the problem, the plan, and the anticipated results. Answer the "so what?" and "why do this?" questions early.

Do give credit where credit is due; cite your colleagues' work (include titles) where appropriate.

Do give results of research resulting from your previous NSF grants.

Do check and review the proposal with a colleague. *Reviewers may equate error with sloppy research.*

Don't assume that everyone reviewing your proposal is expert in all aspects of your research. *Some reviewers may be chosen for their knowledge of just part of the proposal.*

Don't leave out vitae of major investigators, budget explanation, other-grant-support list, whole pages, etc.

Don't inflate the budget.

Proposers are reminded to identify the program solicitation number (NSF 01-81) in the program announcement/solicitation block on the proposal Cover Sheet (NSF Form 1207). Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Budgetary Information

Cost sharing is not required in proposals submitted under this Program Announcement.

Other Budgetary Limitations:

Budget provisions for field services in Antarctica

In Antarctica, most support services are provided and paid for by the NSF-funded U.S. Antarctic Program. NSF does not provide funds in antarctic research grants for acquisition of all needed field items and services. Instead, common-use items are bought and shipped to Antarctica in bulk. This practice, while affecting the way an investigator plans for field work, lowers the cost of acquiring and, especially, of shipping things to Antarctica.

Investigators use their proposals, and pertinent worksheets (see Operational Requirements section), if they are useful, to specify services and items of equipment that are required for their research. To plan and budget for acquisition of these things, NSF must know well in advance what they are and approximately how much they cost.

Describe and budget in your proposal as necessary for these items:

1. equipment and supplies required at home institutions or unique to the field project
2. radioisotopes and specialized supplies required in Antarctica
3. physical and dental examinations for all persons going to Antarctica (including those who have been before)
4. field equipment that is unique to a field project, such as climbing boots and eye protection (the Foundation issues polar clothing including insulated underwear, mukluks, thermal boots, parka, insulated overalls, gloves, and other extreme-cold-weather gear)
5. shipment of your gear between home institution and port of embarkation (usually a West Coast port; see worksheets)
6. cost of shipping equipment and samples back home (the antarctic program provides northbound sea shipment to a U.S. port without cost to the grantee, but onward transport to the home institution is paid for using your grant funds)
7. living expenses (per diem) during travel to and from Antarctica. Budget under foreign travel.
8. mountaineering guide, if warranted, for field work.

Commercial air travel

Do *not* budget in your proposal for commercial air travel between your home institution and the departure point for Antarctica (normally Christchurch, New Zealand, or Punta Arenas, Chile). The Foundation's antarctic support contractor will issue tickets at no cost to your grant. Accompanied excess baggage authorized by NSF in advance also will be covered by the contractor. *Do* budget in the proposal for per diem during this travel [see (7) above] and for any travel not involving deployment to Antarctica.

Insurance

NSF does not provide insurance for grantee personnel in Antarctica, and it does not fund acquisition of this insurance in its research grants. Persons traveling to Antarctica are expected to have insurance appropriate to their normal life situations so that any needed health care, compensation for property loss, worker's compensation, or survivor benefit will be provided for. Medical care for USAP participants in Antarctica is provided in clinics at the year-round stations. Persons who may need care beyond the capabilities of these clinics will be transported to health care facilities in New Zealand, South America, or the United States, at which point they or their sponsors will be responsible for medical costs.

All research staff (paid or volunteer) should be affiliated in some manner with your institution(s), so any worker compensation issues arising from injuries sustained while deployed can be addressed. Most health insurance policies cover travel to Antarctica, but some may not. Policies should be examined.

C. Deadline/Target Dates

Proposals must be submitted by the following date(s):

Full Proposals *by 5:00 PM local time*: June 1, 2001

To provide time for proposal review and for operational planning, proposals normally will be considered for field work beginning no sooner than a year later. For example, properly prepared proposals received by 1 June 2001 and approved for award typically will be provided funds for performance periods as follows:

- for research in Antarctica: the 2002-2003 austral summer and extending through the winter of 2003
- for research in the United States: starting as early as 6 months following receipt of your proposal

Complicated projects, or those requiring lots of equipment in Antarctica, could require more lead time than indicated above. Projects that are easily fielded may be able to deploy more quickly than the schedule suggests, and NSF strives to make that happen. The rule of thumb, however, is that it takes 15 to 18 months to get ready for antarctic field work, and attempts to beat that schedule introduce uncertainty.

D. FastLane Requirements

Proposers are required to prepare and submit all proposals for this Program Announcement through the FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at: http://www.fastlane.nsf.gov/a1/newstan.htm. For FastLane user support, call 1-800-673-6188.

Submission of Signed Cover Sheets. The signed copy of the proposal Cover Sheet (NSF Form 1207) must be postmarked (or contain a legible proof of mailing date assigned by the carrier) within five working days following proposal submission and be forwarded to the following address:

National Science Foundation
DIS – FastLane Cover Sheet
4201 Wilson Blvd.
Arlington, VA 22230

VI. PROPOSAL REVIEW INFORMATION

A. NSF Proposal Review Process

Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program

Officers charged with the oversight of the review process. NSF invites the proposer to suggest at the time of submission, the names of appropriate or inappropriate reviewers. Care is taken to ensure that reviewers have no conflicts with the proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority-serving institutions, or adjacent disciplines to that principally addressed in the proposal.

Proposals will be reviewed against the following general review criteria established by the National Science Board. Following each criterion are potential considerations that the reviewer may employ in the evaluation. These are suggestions and not all will apply to any given proposal. Each reviewer will be asked to address only those that are relevant to the proposal and for which he/she is qualified to make judgements.

What is the intellectual merit of the proposed activity?
How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?
How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

Principal Investigators should address the following elements in their proposal to provide reviewers with the information necessary to respond fully to both of the above-described NSF merit review criteria. NSF staff will give these elements careful consideration in making funding decisions.

Integration of Research and Education
One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities
Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

Additional Review Criteria

In addition to external peer review, proposals involving field work in the Antarctic are evaluated by the U.S. Antarctic Program for operational feasibility, which includes environmental protection and waste management provisions, safety and health measures, and safeguards of radioactive materials. All field participants must meet specified health and dental requirements. Candidates for wintering at the year-round stations are screened for psychological fitness.

For examples of activities that address the standard review criterion, "What are the broader impacts of the proposed activity," proposers are encouraged to consult the report of the OPP Advisory Committee on this topic. The document is available from OPP program officers. See also "Education" in Section II of this program announcement.

A summary rating and accompanying narrative will be completed and signed by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are sent to the Principal Investigator/Project Director by the Program Director. In addition, the proposer will receive an explanation of the decision to award or decline funding.

B. Review Protocol and Associated Customer Service Standard

All proposals are carefully reviewed by at least three other persons outside NSF who are experts in the particular field represented by the proposal. Proposals submitted in response to this announcement/solicitation will be reviewed by Mail and/or panel review.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

NSF will be able to tell applicants whether their proposals have been declined or recommended for funding within six months for 95 percent of proposals. The time interval begins on the proposal deadline or target date or from the date of receipt, if deadlines or target dates are not used by the program. The interval ends when the Division Director accepts the Program Officer's recommendation.

In all cases, after programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications and the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at its own risk.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program Division administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See section VI.A. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (NSF-GC-1)* or Federal Demonstration Partnership (FDP) Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreement awards also are administered in accordance with NSF Cooperative Agreement Terms and Conditions (CA-1). Electronic mail notification is the preferred way to transmit NSF awards to organizations that have electronic mail capabilities and have requested such notification from the Division of Grants and Agreements.

*These documents may be accessed electronically on NSF's Web site at http://www.nsf.gov/home/grants/grants_gac.htm. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 or by e-mail from pubs@nsf.gov.

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, available electronically on the NSF Web site at http://www.nsf.gov/cgi-bin/getpub?gpm. The GPM is also for sale through the Superintendent of Documents, Government Printing Office (GPO), Washington, DC 20402. The telephone number at GPO for subscription information is (202) 512-1800. The GPM may be ordered through the GPO Web site at http://www.gpo.gov.

Special Award Conditions

Data deposition requirement. The Office of Polar Programs requires submission of OPP-supported data, derived data products, samples, physical collections, and other supported materials to national data centers and other specified repositories. It expects investigators to share these things with other researchers at no more than incremental cost and within a reasonable time. The office also considers metadata (information about data or data sets) as vital to the exchange of information on polar research; archives of OPP-supported projects should include easily accessible information about the holdings including quality assessments, supporting ancillary information, and guidance for locating and obtaining the data. Investigators should use national and international standards to the greatest extent possible for collection, processing, and communication of OPP-sponsored data sets. See the Office of Polar Programs Guidelines and Award Conditions for Scientific Data.

These guidelines are in addition to the requirement in NSF's Grant General Conditions (section 20) to acknowledge NSF support in your publications and to assure that two copies of every publication developed under the award, labeled with the award number, are sent to the cognizant NSF program officer promptly after publication.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the PI must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period.

Within 90 days after the expiration of an award, the PI also is required to submit a final project report. Approximately 30 days before expiration, NSF will send a notice to remind the PI of the requirement to file the final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

NSF has implemented an electronic project reporting system, available through FastLane. This system permits electronic submission and updating of project reports, including information on project participants (individual and organizational), activities and findings, publications, and other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system.

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries regarding ANTARCTIC RESEARCH should be made to:

- See Office of Polar Programs roster on the NSF web site..

For questions related to the use of FastLane, contact:

- Desiree Marshall, Lead Program Assistant, Antarctic Sciences Section, 755, telephone: 703-292-8033, e-mail: Ant2001@nsf.gov.

IX. OTHER PROGRAMS OF INTEREST

The NSF *Guide to Programs* is a compilation of funding for research and education in science, mathematics, and engineering. The NSF *Guide to Programs* is available electronically at http://www.nsf.gov/cgi-bin/getpub?gp. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter.

Many NSF programs offer announcements or solicitations concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices. Any changes in NSF's fiscal year programs occurring after press time for the *Guide to Programs* will be announced in the NSF E-Bulletin, which is updated daily on the

NSF web site at http://www.nsf.gov/home/ebulletin, and in individual program announcements/solicitations. Subscribers can also sign up for NSF's Custom News Service (http://www.nsf.gov/home/cns/start.htm) to be notified of new funding opportunities that become available.

NSF crosscutting programs

A big part of NSF's budget supports research and education that cross traditional disciplinary boundaries. Typically, more than one NSF office or directorate funds these programs; other Federal agencies provide funds for some of them. Because the Antarctic is appropriate to research in several disciplines, these crosscutting programs can be particularly attractive to investigators planning antarctic research.

The Office of Polar Programs strongly encourages scientists to know these programs and to consider submitting proposals that respond to the special opportunities that they present to participate in some of the forefront areas of science.

Other opportunities to participate in the U.S. Antarctic Program

As the Federal agency responsible for representing the Nation in Antarctica, NSF provides opportunities for field participation in the U.S. Antarctic Program that go beyond its traditional role of supporting research and education in the sciences and engineering. See Opportunities for Participation.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Awardees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation.

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages women, minorities and persons with disabilities to compete fully in its programs. In accordance with Federal statutes, regulations and NSF policies, no person on grounds of race, color, age, sex, national origin or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF (unless otherwise specified in the eligibility requirements for a particular program).

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the program announcement/solicitation for further information.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090, FIRS at 1-800-877-8339.

The National Science Foundation is committed to making all of the information we publish easy to understand. If you have a suggestion about how to improve the clarity of this document or other NSF-published materials, please contact us at plainlanguage@nsf.gov.

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to applicant institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies needing information as part of the review process or in order to coordinate programs; and to another Federal agency, court or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records," 63 Federal Register 268 (January 5, 1998). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

Pursuant to 5 CFR 1320.5(b), an agency may not conduct or sponsor, and a person is not required to respond to an information collection unless it displays a valid OMB control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding this burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to: Suzanne Plimpton, Reports Clearance Officer, Information Dissemination Branch, Division of Administrative Services, National Science Foundation, Arlington, VA 22230, or to Office of Information and Regulatory Affairs of OMB, Attention: Desk Officer for National Science Foundation (3145-0058), 725 17th Street, N.W. Room 10235, Washington, D.C. 20503.

OMB control number: 3145-0058.